14 (3) (2025) 1096 - 1100
Journal of Physical Education, Sport, Health and Recreations
https://journal.unnes.ac.id/journals/peshr

Effect of Arm Strength, Jump, and Height on Basketball Shooting Accuracy

Aris Mulyono[1]✉, Priyanto[2], Cahyo Yuwono[3], Fery Darmanto[4], Dhika Panca Agustina[5], Muhammad Zihni Naim[6], Khoirul Anam[7]

Physical Education-Sport-Health and Recreations, Faculty of Sports Science, Universitas Negeri Semarang, Central Java, Indonesia[1234567]

Article History

Received September 2025
Accepted October 2025
Published Vol.14 No.(3) 2025

Keywords:
Basketball Shooting; Physical Ability; Adolescent Athletes

Abstract

This study aims to determine the effect of arm muscle strength, jump height, and height on the accuracy of basketball shots in students aged 12-15 years. The research problem arises from the gap between students' high enthusiasm for basketball and the inconsistent shooting results they achieve. This study uses a quantitative approach with a correlational design. The research subjects consisted of 34 male students from Public Middle School 22 Semarang who were selected randomly. The data collection involved physical fitness assessments, such as push-ups to measure arm muscle strength, vertical jumps to gauge jumping proficiency, height measurements with a stadiometer, and shooting tests utilizing a jump. Data analysis was performed using SPSS version 25, which included descriptive tests, prerequisite tests (normality and homogeneity), and multiple linear regression. The results showed a coefficient of determination (R^2) of 0.147, indicating that the three variables collectively contributed only 14.7% to shooting ability. The ANOVA test yielded a significance value of 0.183, which is greater than 0.05, and the partial test also showed no significant effect from each independent variable. These findings suggest that shooting success in adolescents is more influenced by factors such as mastery of basic techniques, movement coordination, and training experience.

How to Cite

Mulyono, A., Priyanto., Yuwono, C., Darmanto, F., Agustina, D. P., Naim, M. Z., Anam, K. (2025). Effect of Arm Strength, Jump, and Height on Basketball Shooting Accuracy. Journal of Physical Education, Sport, Health and Recreation, 14 (3), 1096-1100.

✉ Correspondence address :
E-mail: arism@mail.unnes.ac.id

p-ISSN 2460-724X
e-ISSN 2252-6773

INTRODUCTION

Basketball is a very popular sport around the world, even in Indonesia. Basketball players tend to need players who have the best physical talents, such as strength, speed, and agility, all of which help their technical skills (Avloniti et al., 2015). Shooting ability is one of the most important technical skills because it is the key to scoring points. Players that are strong at shooting can not only score points well, but they can also manage the pace of the game, which boosts the team's confidence and morale as a whole (Febriani et al., 2022).

There are several things that can affect how well you shoot, such as how strong your arm muscles are, how high you can jump, and how tall you are. When you throw the ball, the strength of your arm muscles helps you get it to go where you want it to go and hit the target. Jumping also gives players an edge in height and range of motion, which makes it more likely that they will make a shot (Wei et al., 2025). Anthropometric characteristics, particularly height, provide biomechanical advantages to players (Profile & Profile, 2022). Therefore, these three factors are believed to significantly influence shooting ability in basketball.

Previous research has examined the components that determine shooting ability. Research by (D. Aryanti & Supriyadi, 2021) suggests that a multidimensional approach encompassing maturity status, physical skills, and technical skills can provide useful insights into the development of young athletes. However, this study only involved individuals aged 15 to 16 years. (Almi et al., 2023) found that arm muscle strength, hand-eye coordination, and attention substantially influence the free-throw ability of adolescent basketball players. However, this study was limited to a small sample size. In the meantime, (Prabowo et al., 2025) showed that eight weeks of explosive strength training can improve the shooting % of elite male professional basketball players. However, these results do not apply to lower age groups. Furthermore, Peivu (2024) research confirms that core strength training has a positive effect on the balance and shooting accuracy of male basketball players; however, this research is also limited to a sample of professional players.

These findings suggest that muscle strength, jumping ability, and anthropometric characteristics play a significant role in shooting success. However, most previous studies have focused on professional athletes or specific age groups, leaving limitations in studies on adolescents aged 12-15 years. In fact, this stage is a critical phase of physical and motor skill development. The American Academy of Pediatrics (AAP) recommends team sports like basketball for children aged 12 to 15 because they can improve physical health, social skills, and self-confidence (Torresunda et al., 2013). This is consistent with a report by the National Federation of State High School Associations (NFHS) and findings in the Journal of Sports Science and Medicine, both of which emphasize the importance of basketball in the motor and psychosocial development of adolescents (Esteban Salvador et al., 2023).

Observations at Public Middle School 22 Semarang revealed technical problems in students' shooting skills. Some of the weaknesses found are low shooting accuracy, not enough power when releasing the ball, and bad ball control when shooting (Haryanto et al., 2024). At Public Middle School 22 Semarang, it was clear that students were having trouble with their shooting skills. Some of the weaknesses found are low shooting accuracy, not enough power when releasing the ball, and bad ball control when shooting (Haryanto et al., 2024). This problem is interesting because the students are very interested in basketball, but only a few of them can score consistently. This validates the disparity between the students' enthusiasm and their technical proficiency (S. Aryanti & Sriwijaya, 2022). The research question posited in this study is whether arm muscle strength, jump height, and stature affect basketball shooting performance in students aged 12 to 15 years.

This study is unique because it focuses on early adolescents aged 12 to 15 years, a group that hasn't been studied much in previous basketball performance research. Previous studies primarily focused on professional or older athletes through intricate biomechanical methodologies; this research highlights a practical, school-based perspective (Cieślicka et al., 2019). The study examines the correlation between arm muscle strength, jump height, and body height on shooting accuracy among a junior high school demographic, offering novel insights into the utilization of straightforward, quantifiable physical attributes for the assessment and improvement of students' shooting proficiency (Zhang et al., 2023). This viewpoint aids in the formulation of more accessible evaluation frameworks and training methodologies for physical education instructors and youth basketball coaches.

METHODS

This study used a quantitative approach with a correlational design. This design was selected to investigate the correlation between independent variables, including arm muscle strength, jump height, and stature, and the dependent variable, specifically basketball shooting performance, in students aged 12 to 15 years (Mahyuddin & Sudirman, 2021). The study was conducted at Public Middle School 22 Semarang, which features excellent basketball courts and assistance from physical education instructors. The study took place over three months, from April to June 2025.

The research population consisted of all male students in grades 7, 8, and 9 at Public Middle School 22 Semarang. The research sample consisted of 100 students selected using random sampling techniques, provided that they were registered as active students and had obtained approval from the school (Mayangsuri et al., 2023).

This study consists of three independent variables and one dependent variable. The independent variables consisted of arm muscle strength, jump height, and overall height, while the dependent variable was basketball shooting performance (Radenkovi et al., 2023). Data collection was conducted through physical tests and direct measurements. Arm muscle strength was measured using push-up and pull-up tests, jump results were measured using vertical jump tests, height was measured using a stadiometer, and shooting results were measured using jump shoot tests (Prasetya et al., 2022). All instruments used have been proven valid and reliable based on previous studies, making them suitable for use in data collection. SPSS software version 25 was used to analyze the data that had been collected. The analyses employed comprised descriptive analysis to furnish an overview of the research data and multiple linear regression analysis to ascertain the relationship between independent and dependent variables. **Figure 1** below presents the research process used in this study.

RESULTS AND DISCUSSION

This study was conducted on Friday, July 18, 2025, at Public Middle School 22 Semarang with 34 respondents aged 13-15 years who were randomly selected based on predetermined criteria. This study has obtained official permission from the Semarang City Education Office and the relevant school authorities. The research was conducted in a single day, involving data collection activities that included physical tests (push-ups, vertical jumps, and basketball shooting) and height measurements. SPSS version 25 was used to analyze the data in three main steps: descriptive analysis, data prerequisite testing, and multiple regression testing.

The statistical analysis in this study seeks to ascertain the impact of arm musculature, vertical leap capability, and stature on basketball shooting efficacy. The statistical analysis in this study was conducted using SPSS 25. To present the descriptive statistical results, we look at the mean, minimum, maximum, and standard deviation values in the group of children aged 12-15 years, in this case, students of Public Middle School 22, as follows **Table 1.**

Table 1. Description Statistics

	N	Range	Min	Max	Mean		Std. Deviation	Variance
					Statistics	Std. Error		
Height	34	155	19	174	152.01	4.222	24.62	606.134
Push-up	34	18	1	19	4.6	0.481	2.805	7.867
Vertical Jump	34	3	1	4	2.44	0.141	0.824	0.678
Shooting	34	1	0	1	0.09	0.049	0.288	0.083
Valid N (listwise)	34							

According to **Table 1**, 34 students responded. The mean value of each variable shows that most students have similar physical talents. This is shown by the fact that the standard deviation value is smaller than the mean value. Before doing more analysis, tests for normality and homogeneity were done on the data that was needed.

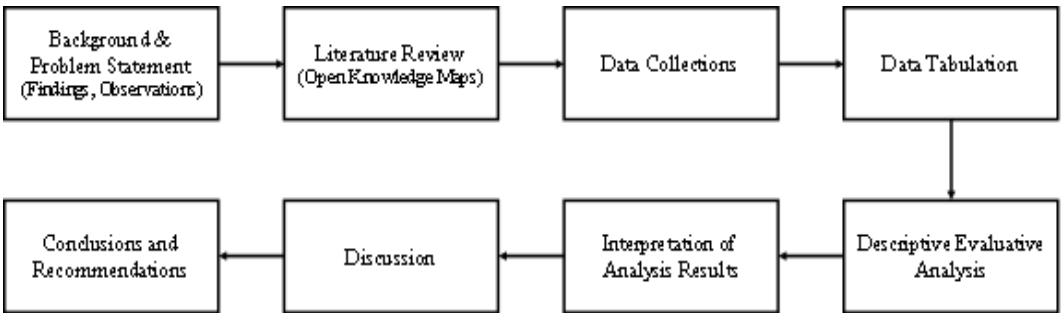

Figure 1. Research Process

The normality test checks to see if the data distribution is right for the normal distribution.

The outcome of the Kolmogorov-Smirnov test. The significance value is 0.200, which is greater than 0.05, which means that the data is typically distributed. We did a homogeneity test to see if the variances between the groups were the same.

The result of the Levene test is a significance value of 0.152, which is greater than 0.05, indicating that the data have homogeneous variance. Multiple regression analysis was conducted to determine the extent to which independent variables, namely arm muscle strength (as measured by push-ups), leg explosive power (as measured by vertical jump), and height, influenced the dependent variable, basketball shooting ability. This analysis used the enter method, which includes all independent variables in the model at the same time.

The variables entered in the model, any variables removed, and how the analysis was conducted. Based on Table 4, the independent variables used in the analysis are height, vertical jump, and push-ups. Basketball shooting ability is the dependent variable in this study. The entry technique is employed, which implies that all of the independent variables are put into the model at the same time and none are left out. The table shows the correlation coefficient (R), the coefficient of determination (R-squared), the adjusted R-squared, and the standard error of estimate. These numbers illustrate how strong the link is between the independent and dependent variables and how much of the dependent variable's change can be explained by the independent variables.

The coefficient of determination (R Square) value is 0.147. This means that height, push-ups, and vertical jump together only explain 14.7% of shooting ability. The other 85.3% is due to things that are not covered by this study.

The ANOVA test seeks to ascertain whether independent variables, including height, vertical jump, and push-ups, concurrently exert a significant influence on the dependent variable, specifically basketball shooting ability. The ANOVA table shows the sum of squares, degrees of freedom (df), mean square, calculated F-value, and significance value (Sig).

The significance value (Sig.) is 0.183. The value is above 0.05, so the hypothesis is rejected. This means height (X1), vertical jump (X2), and push-ups (X3) do not have a significant effect on basketball shooting ability (Y) when tested together. The three variables still influence shooting, but their combined effect is not strong enough to explain the overall differences in shooting performance. Other factors not examined in this study are likely to exert a greater influence on students' shooting performance.

To determine the effect of independent variables (height, vertical jump, and push-ups) on the dependent variable (shooting), a regression coefficient test was conducted.

Based on the results of the regression coefficient analysis, it is known that the variables of height, vertical jump, and push-ups have a significance value greater than 0.05. This suggests that, to some extent, these three variables do not have a significant impact on shooting ability in basketball. Thus, even though simultaneous and partial tests were conducted, the results of this study indicate that height, vertical jump, and push-ups are not the main determinants of shooting accuracy.

The results of the study indicate that arm muscle strength, jump height, and height do not significantly affect basketball shooting in students aged 12-15 years. This shows that other factors, such as mastery of basic techniques, motor coordination, and training experience, are more dominant in determining shooting success (Issn, 2023).

These findings align with the opinion of (Dezman et al., 2001), who stated that the complexity of techniques and interrelated physical conditions influences basketball skills. In addition, (Shamim, 2024) emphasized that shooting accuracy is determined more by the quality of the jump and coordination of movement than by height or muscle strength alone. Another study by (Sciences, 2008) also confirms that success in basketball is closely related to anaerobic capacity, speed, agility, and leg muscle endurance.

Thus, although anthropometric factors and muscle strength play a role, shooting skills place greater emphasis on technical aspects, training consistency, and overall motor readiness.

CONCLUSION

Based on the study's results, it can be concluded that height, arm muscle strength, and vertical jump ability do not have a notable effect on the accuracy of basketball shooting among students aged 13-15 years.

These findings indicate that shooting success is determined more by other factors, such as mastery of basic techniques, training experience, and movement coordination. Therefore, physical conditioning training needs to be integrated with

learning the techniques of ball games, especially basketball, so that students can master the skills optimally.

REFERENCES

Almi, R. S., Wahyuri, A. S., Kiram, P. Y., & Neldi, H. (2023). The influence of shooting practice methods with beef and game concepts on the basketball shooting results of junior high school students. 19(2), 126–135.

Aryanti, D., & Supriyadi, M. (2021). Penerapan Metodi Latihan Shooting Konsep BEEF Keterampilan Shooting Bola Basket Club Magic Kids Foundation Lubuklinggau Implementation of Shooting Method BEEF Concept to Basketball Shooting Skill on Foundation Magic Kids of Lubuklinggau. 11, 153–159.

Aryanti, S., & Sriwijaya, U. (2022). Students ' Interest And Motivation Survey On Basketball Extracurricular Activities. 7(1), 9–13.

Avloniti, A., Chatzinikolaou, A., Fatouros, I. G., & Protopapa, M. (2015). The effects of static stretching on speed and agility : One or multiple repetition European Journal of Sport Science The effects of static stretching on speed and agility : One or multiple repetition protocols ? April. https://doi.org/10.1080/17461391.2015.1028467

Cieślicka, M., Kozina, Z., & Muszkieta, R. (2019). Original Article Integral development of jumping and of shot accuracy of young basketball players 12-13 years. 19(3), 992–1002. https://doi.org/10.7752/jpes.2019.s3143

Dezman, B., Trninić, S., & Dizdar, D. (2001). Expert model of decision-making system for efficient orientation of basketball players to positions and roles in the game--empirical verification. Collegium Antropologicum, 25(1), 141–152.

Esteban Salvador, M. L., Fernandes, E. P., Di Cimbrini, T., Smith, C., & Güngör Göksu, G. (2023). National Federation of State High School Associations. Gender in Management, 39(4), 497–515. https://doi.org/https://doi.org/10.1108/GM-10-2022-0328

Febriani, A. R., Hidayat, R., Syafei, M., Budi, D. R., Kesehatan, F. I., Keolahragaan, F. I., Semarang, U. N., Throw, S. F., & Biomekanik, A. (2022). Sport Science: Jurnal Sains Olahraga dan Pendidikan Jasmani. 22, 44–52.

Haryanto, J., Dwi, I., Wati, P., Thamrin, L., Zarya, F., Suryadi, D., Suganda, M. A., Setiawan, H., Suhartini, B., Sinulingga, A., & Medan, U. N. (2024). Analysis of basketball shooting ability: a cross-sectional study of elementary school students Análisis de la capacidad de tiro en baloncesto: estudio transversal de alumnos de primaria. 2041, 1230–1236.

Issn, E. (2023). JUARA : Jurnal Olahraga Affecting Factors of Shooting Ability In Basketball Games : Coordination And.

Mahyuddin, R., & Sudirman, A. (2021). Korelasi Koordinasi Mata Tangan Dan Kekuatan Otot Lengan Dengan Shooting Bola Basket. Jurnal Olahraga Dan Kesehatan Indonesia, 1, 96–101. https://doi.org/10.55081/joki.v1i2.305

Mayangsuri, S. M., Pelana, R., & Sulaiman, I. (2023). Available online at : http://journal.unj.ac.id/unj/index.php/gjik Permalink / DOI : https://doi.org/10.21009/GJIK.144.08 The Effectiveness Of The Shooting Training Model Using The Repetition Method In Basketball For Aged 12-14 Years. 14(04), 441–448.

Prabowo, A., Barnanda, O., Permadi, A., Raibowo, S., & Ghenaro, D. (2025). The Effect of Shooting Training Methods with the BEEF Concept on Basketball Extracurricular Free Throw Shooting Ability. 10(01), 144–152.

Prasetya, A. T., Indrawan, K. A., Gusti, N., & Lia, A. (2022). The Effect of Push Up and Pull Up Exercises on Shooting Free Throw Results in Basketball Athletes in Jembrana Regency. 3(2), 171–178.

Profile, S. E. E., & Profile, S. E. E. (2022). A Biomechanical Analysis of the Free Throw Shooting Technique in Wheelchair Basketball : A Pilot Study. February. https://doi.org/10.26773/jaspe.220101

Radenkovi, M., Tomovi, M., Kouidi, E., & Preljevi, A. (2023). Effects of Combined Plyometric and Shooting Training on the Biomechanical Characteristics during the Made Jump Shot in Young Male Basketball Players.

Sciences, H. (2008). T Oward A S Tandard E Valuation Of. 1066–1072.

Shamim, P. (2024). Mechanical analysis of basketball shooting : A review study Mechanical analysis of basketball shooting : A review study. February 2020. https://doi.org/10.22271/kheljournal.2020.v7.i1c.3512

Torres-unda, J., Zarrazquin, I., Gil, J., Ruiz, F., Irazusta, A., Kortajarena, M., Seco, J., Irazusta, J., Zarrazquin, I., Gil, J., Ruiz, F., & Irazusta, A. (2013). Anthropometric , physiological and maturational characteristics in selected elite and non-elite male adolescent basketball players. 0414. https://doi.org/10.1080/02640414.2012.725133

Wei, B., Li, Z., Zhou, C., Gómez, M.-Á., & Zhang, M. (2025). Enhancing team dynamics: Unveiling synergy effects through social network analysis in professional basketball. Acta Psychologica, 261, 105747. https://doi.org/https://doi.org/10.1016/j.actpsy.2025.105747

Zhang, M., Miao, X., & Rupˇ, T. (2023). applied sciences Determining the Relationship between Physical Capacities , Metabolic Capacities , and Dynamic Three-Point Shooting Accuracy in Professional Female Basketball Players.